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Commercial Pruning: An Economic Gamble

By Jim Jeter, Forest Management Specialist, Alabama Forestry Commission

Should pruning be a fundamental part of a forest management plan? The answer to this question is more complex than one might think.

The primary purpose of commercial pruning is to increase the amount of clear wood produced by selected trees. Most of the volume of a given tree is in the first 16 feet, commonly called the butt log. Removing limbs while a tree is young produces more wood free of knots and other blemishes in the butt log, thereby bringing a higher market price. The concept is simple; the process is not.

Pruning, at best, is a speculative gamble. The risk is in estimating the future market of grade sawtimber, and banking on the harvest price of a given stand to offset the capital investment of pruning.

All branch cuts should be made just outside the branch collar, which should be protected from damage.

Pruning is a labor intensive silvicultural activity. Assuring an economically feasible operation demands careful consideration of special sites and objectives before making the decision to prune.

Terms

To evaluate the potential productivity of forestland, it is important to understand certain forestry terms.

Basal Area - the basal area of a tree is the cross-sectional area, in square feet, of the trunk at breast height (4½ feet above the ground). Basal area per acre is the sum of basal areas of the individual trees on the given acre. For example, on site index 80 land, a basal area of 120 square feet would be over-stocked, 60 square feet would be under-stocked and 75 to 85 square feet would be just right.

Live Crown Ratio – live crown ratio is described as the percentage of a tree's total stem which has living branches, i.e., live crown length divided by total height. A ratio of approximately 40 percent is

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CALENDAR OF EVENTS

Apr 12-14 - ARC/GIS/Toolkits training, Auburn, AL
Apr 19 - Construction BMP Planning, Bhm, AL
Apr 19-21 - ARC/GIS/Toolkits training, Auburn, AL
Apr 26-28 - ARC/GIS/Toolkits training, Auburn, AL
Apr 27 - Construction BMP Planning, Montgomery, AL
May 3-5 - SE Exotic Pest Plant Council's Conf, Bhm, AL
May 8-11 - American Indian Mtg, Atmore, AL
May 9 - Interagency Waste Mngt Team Mtg, Auburn, AL
May 16-20 - NASIS Training, Auburn, AL
May 21-26 - Ntl Soil Survey Conf, Corpus Christi, TX
May 22-25 - Ntl Watershed Coalition, Ft. Mitchell, KY
Jun 1-3 - RC&D Annual Mtg, Point Clear, AL
Jun 8 - Sediment Control Field Day, Bhm, AL
Jun 8-10 - AL Chapter of SWCS Annual Mtg, Bhm, AL
Jun 14-16 - Ntl SS Schedule Analysis and Design Core Team, Lincoln, NE
Jun 15 - State SWCC Mtg, Montgomery, AL
Jun 14-17 - Pond 101 Training, Auburn, AL
Jul 12 - Forestry Planning Committee Mtg, Auburn, AL
Jul 12-13 - Mid-Year Con Practices Mtg, Auburn, AL
Jul 14 - AACD Area V Exec Board Mtg, TBD, AL
Jul 15-19 - NACD SE Regional Mtg, Louisville, KY
Jul 23-24 - Grazefest 2005, Jackson, MS
Jul 24-28 - Ntl SWCS Mtg, Rochester, NY

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optimum for merchantable size trees. Trees with less than a 30 percent ratio grow slowly and are less vigorous; trees with a ratio over 50 percent ratio contain too many knots and yield lower quality wood products.

"There are three basic pruning techniques: one-step and two-step pruning if managing for sawtimber, and a third technique if managing for plywood bolts."

Site Index – site index is a measure of forest site quality based on the height in feet of the dominant trees at a specified age. The two basic site index curves are Base Age 25 and Base Age 50. Base Age 25 indicates how tall a tree on given quality land will be at 25 years of age. Base Age 50 indicates the measure of the tree at 50 years of age.

Assistance in understanding these terms and applying them to individual forestland is available through your local Alabama Forestry Commission office.

Considerations

The age of the pine stand is the first consideration. Pruning must begin early in the life of the stand in order to produce the clearest wood. The stand should have at least 20 years left in the rotation.

Only sawtimber rotations designed to produce quality grade sawlogs should be considered for commercial pruning. Special objectives such as producing plywood bolts may also be evaluated.

Pruning should not be considered on land with less than site index 75 (Base Age 50). The timber will not grow rapidly enough to offset the capital investment.

Pruning Techniques

There are three basic pruning techniques: one-step and two-step pruning if managing for sawtimber, and a third technique if managing for plywood bolts. The technique selected depends on the landowner's long-term objectives for the timber.

All three require the same physical pruning techniques; however, they differ in the timing of the pruning or prunings, the timing of subsequent thinning, and how far on the bole of the tree to prune for product objectives.

The objective of one-step and two-step pruning is to increase the volume of clear wood on the butt log. To insure getting the first 16 feet of the bole, it is recommended that limbs be removed for a total of 17 feet on the bole of the tree. Plywood bolts require limb removal for about 8 to12 feet.

All three require the pine stand to be entered at an early age for site and growth evaluations and, most importantly, for tree selection.

One-step pruning consists of evaluating a stand at 15 to18 years of age depending on the site index. Selected trees are pruned when they reach a height where the first 17 feet of the bole can be pruned while leaving 40 percent live crown ratio. Thinning to 80 to 90 square feet basal area should follow immediately. A second thinning to remove all but the pruned crop trees should occur in approximately 10 to15 years.

Two-step pruning consists of evaluating a stand at 7 to 10 years of age depending on the site index. When the trees reach a height where the first 6 to 8 feet of the tree can be pruned while leaving 40 percent live crown ratio, the first of two prunings should take place. A thinning should follow as soon as the trees are merchantable.

The second phase of a two-step pruning should be implemented when the trees reach a height where the balance of the 17 feet required for the butt log can be pruned while leaving 40 percent live crown ratio. A thinning should follow according to the basal area requirement.

The plywood bolt method involves a pre-commercial thinning leaving approximately 150 to 250 well-spaced trees per acre. All remaining trees are pruned for approximately 8 to12 feet. Tree selection standards and live crown ratios are basically the same as for the other two techniques.

Tree Selection

Pruned trees are expected to last throughout the entire rotation; consequently, careful tree selection is critical to the success of the operation.

Although any species may be commercially pruned, loblolly and slash pines are best suited for this purpose.

Selecting the best trees for pruning involves evaluating a young tree

Other benefits of pruning is shown in this cheerybark oak plantation in Jackson County. The landowner has pruned to improve asthetics, visability, wildiife viewing, etc.

and predicting the qualities of the tree when mature. An experienced eye will help with the task of deciding what a 7- to 18-year-old tree will look like at age 40.

To achieve the greatest volume of clear wood, only dominant or co-dominant trees should be pruned. Trees should be relatively straight and contain no forms, excessive sweep or crook, and have at least 20 years left in the rotation.

Site index is important in determining the number of trees to be pruned on a given acre. As site index increases, one can justify pruning more trees per acre. As a guide, if the land has a site index of 85, then 85 to 90 well-spaced trees should be selected for pruning.

How and When to Prune

Once a tree is selected, all limbs, living or dead, must be pruned to the desired height. All branch cuts should be made just outside the branch collar, which should be protected from damage.

Selecting the correct pruning tools depends on the size and accessibility of the cuts to be made. A well-sharpened pruning saw will work best in most cases. Properly made cuts will callus over regardless of when the cuts are made.

Commercial pruning has proven beneficial under exacting conditions. Several forest industries in Alabama conduct pruning operations on their own land and are optimistic about the investment.

However, it is an economic gamble because a forest landowner might actually lose money by pruning. Special sites and objectives of each individual stand, as well as local market considerations, must be carefully evaluated before any action.

Common Resource Areas and Conservation System Guides

By: Eddie Jolley, Conservation Agronomist, USDA-NRCS, Auburn, AL

In the fall of 2003, NRCS began developing a method to facilitate conservation planning and progress reporting. The idea was to describe common resource concerns in each state and common conservation systems for the different land uses that addressed resource concerns. Additionally, the effects of conservation treatments on the resource concerns were included in those conservation systems. A basic premise in the Conservation System Guides (CSG) development is that the CSG will address about 80 percent of the possible planning needs and resource concerns. The process of CSG development is in a state of perpetual change, but it is for the better.

The purpose of CSG is to reduce documentation time in plan preparation, redundancy in reporting, improve consistency in planning format, provide training for planners, provide information to technical service providers, and facilitate the conservation planning and reporting process while preparing for public scrutiny.

"A basic premise in the development of CSG is that it will address about 80 percent of the possible planning needs and resource concerns."

CSG in Alabama have been developed for most all land uses and for all areas of the state. Land uses include cropland, pasture land, hayland, wildlife, forestland, urban land, and others. Most of the resource concerns addressed include erosion, water quality, plant and animal health, and water quantity.

NRCS planners are now able to access the CSG in the planning process through Toolkits. By locating the land unit on a map, pertinent CSG will be available for the planner to select. The conservation practices that are needed for a particular plan can then be selected and imported into Toolkits. The conservation effects are then linked to the conservation plan and conservation practices.

The planner does have the option to modify the plan after the CSG has been imported making the planning process more flexible.

As information becomes available for measuring the effects of practices on resource concerns, more resource concerns will be added to CSG. But for now, many resource concerns are included in CSG only as a non-measurable concern.

Currently, specialists are evaluating and making pertinent changes to CSG to reflect agency priorities and facilitate the digital capturing conservation progress.

Mulching Machines for Forestry and Wildlife Applications

By: Jason Thompson, Forest Operations Research, USDA-Forest Service, Auburn, AL

In the fall of 2001, the Forest Operations Research Unit of the USDA-Forest Service and the Alabama Forestry Commission sponsored a demonstration of mulching machines in Auburn, Alabama. This exhibition was the result of interest from landowners, land managers, and researchers in methods to reduce hazardous fuels in forest stands.

Wildfires in the western United States and Florida have highlighted the vulnerability of dense, overstocked stands to fire. Mechanical reduction of understory and midstory fuels by mulching or chipping is an option for reducing stand density to allow the reintroduction of prescribed fire into forest stands.

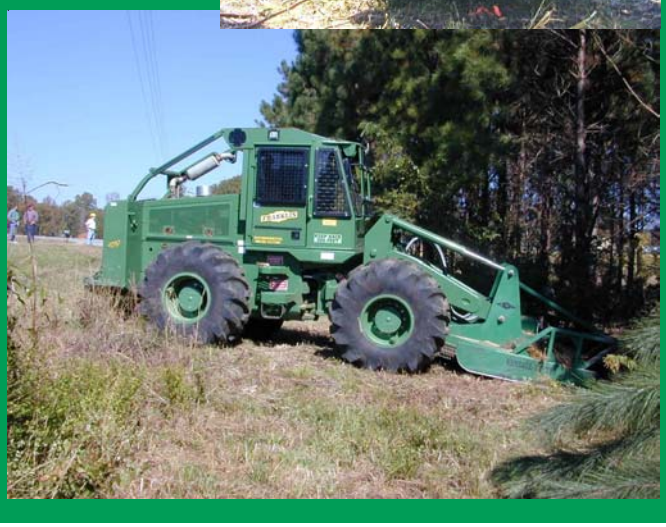
Mulching machines have long been used to maintain utility right-of-ways. You have probably seen one working along the interstate highways in Alabama in recent years. These machines, which employ a horizontal-shaft head with teeth or knives, differ from traditional right-of-way machines that employ a vertical-shaft head with blades (similar to a "bush hog").

Mulching heads can be fitted to a variety of carriers including rubber-tired, tracked, and skid-steer machines. The head can be directly or boom mounted to the carrier. Horizontal-shaft mulching heads can fully chip or mulch the entire bole, limbs, and vegetation to a uniform size and can incorporate the chips into the soil, if desired.

As the technology incorporated into these machines has evolved, so have their potential applications. Most of these applications are common forest management prescriptions. Reducing understory and midstory fuels by mulching is one application that has already been mentioned. Other management objectives can also be met by mulching machines. For example, pre-commercial thinning of overstocked naturally regenerated stands. The demonstration held in Auburn last October involved a third row removal (thinning-to-waste) in an 11-year-old pine plantation. This is not the first option a land owner or manager wants to consider with a stand of this age and size (9-inch average dbh), but it

Horizontal shaft mulching machines have horizontal-shaft head with teeth or knives.

Vertical shaft machines have blades similar to a "bush hog."



may be a viable option in closely planted plantations in times of low market demand for pulpwood. This demonstration also showed the potential of these machines in larger material. With mulching machines now on the market rated at 500 horsepower, even 9+ inch hardwoods offer little resistance. In the wildland-urban interface, fire and smoke are not feasible. Mulching machines can establish and maintain firebreaks in these areas. Other applications include modifying stands to meet wildlife management objectives, controlling southern pine beetle outbreaks, site preparation, and clearing overgrown agricultural land.

The USDA Forest Service Forest Operations Research Unit, located in Auburn, has evaluated several makes and models of mulching machines over the last several years. Studies were performed while the machines worked in several of the applications listed above. From these studies, productivity and cost were measured. Machine productivity is affected by spacing of residual trees, operating pattern, prescription, terrain, operator experience and motivation, and machine type. Productivity ranged from 0.2 acre/hour up to 1.6 acre/hour. Machine cost was calculated using the machine rate method. A cost per acre was calculated using the operating and owning cost calculated (including 30% for overhead and profit) and the measured productivity. A cost per acre for a typical midsize machine (200 hp) with productivity of 1.0 acre/hr was calculated to be in the range of $180/acre (2002).

Since the demonstration in the fall of 2001, interest in mulching machines and their potential applications have continued to increase. Three years ago a land owner or land manager might have had to look out of state for a contractor that offered mulching services. Today there may well be a contractor in the local area. Bach and DeVos Forestry and Wildlife Services (*http://www.bachanddevos.com*)*, from Montgomery, Alabama, purchased a mulching machine in 2004 and have been offering services for a wide range of applications. They operate a 185-hp Hydro-Ax rubber-tired carrier fitted with a Fecon horizontal shaft head. Ted DeVos, a registered forester and a certified wildlife biologist, said they have used the machine for quail habitat improvement, boundary line clearing, clearing re-growth on harvested sites and for real estate development. They have had a steady business with the machine as more and more landowners and managers learn about the machine and see what it is capable of. Their work range for the machine is generally the state of Alabama, although they have worked in Mississippi and Georgia. The machine cost is $185/hr for the first 30 hours, $175/hr for 30 to 60 hrs and $165/hr for 60 or more hours of work.

Mulching machines offer a variety of options to forest landowners and managers in meeting their management objectives. Potential applications, that have been discussed here, include pre-commercial thinning, establishing firebreaks, wildlife plots, restoring wildlife habitat, controlling southern pine beetle outbreaks, and real estate development. As landowners and managers become aware of these machines and their potential applications, they are increasing using them in their management activites.

* *Note: The use of trade, firm, or corporation names in this article is for the information and convenience of the reader. Such use does not constitute an official endorsement or approval by the United States Department of Agriculture or the Forest Service of any product or service to the exclusion of others that may be suitable.*

(top) Harris grinder, horizontal shaft machine, working. (right) Area treated with Harris grinder.

Gully Restoration Project Completed in Baldwin County

By Ann Biggs, District Administrative Coordinator, Baldwin County SWCD; and Joyce Nicholas, Soil Conservationist, Perry/Bibb County

"Partnerships" are one of the most effective ways to get conservation practices on the ground, especially while working to solve conservation problems that may otherwise go unassisted. Take, for instance, the "Dixon Gully," which is located in south Baldwin County, also known as the "Habitat and Water Quality through Gully Restoration Project." This erosion problem began a few years back and was brought to the attention of Natural Resources Conservation Service (NRCS) District Conservationist Larry Morris in Bay Minette. At that time, funding was not available from programs administered by NRCS or conventional Alabama State Cost-Share programs. The Baldwin County Soil and Water Conservation District (SWCD) was not to be deterred; so, along with other partners, they began an earnest effort to find a solution to the problem.

The gully was over 1,400 feet long and approximately 80 feet wide at various locations. It had formed in the Weeks Bay watershed due to a combination of heavy rain events and lack of erosion control best management practices. The gully contributed sediment laden water to Fish River, the main tributary of Weeks Bay. Assistance to correct the problem came after the group made a proposal that was selected by the Environmental Protection Agency-Gulf of Mexico Program Office (GMPO). Funding for the project came in September 2002 for the fiscal year 2003. The Statement of Work agreement was signed in May 2003. The design and the conservation plans were developed for the project and construction began on December 20, 2004.

Baldwin County NRCS District Conservationist Larry Morris (l) talks with contractors about the proper use of geotextile fabric for stabilization.

The partners for this project were state and federal agencies that gave both technical advice and or financial assistance. Each agency had specific responsibilities that included activities such as oversight of the grant and other staff involvement, outreach and assistance with outreach programs, interaction between the project and local landowners, volunteer-led water quality monitoring, and technical expertise to design and install the conservation practices.

Rock was installed to stabilize the 1,400 foot gully.

"Working together in a timely manner enabled the group to meet and exceed projected completion dates."

----Mary Beth VanPelt, Gulf of Mexico Program

Partners included:

- Baldwin County Soil and Water Conservation District
- Natural Resources Conservation Service
- Gulf of Mexico Program
- U.S. Fish and Wildlife Service
- Weeks Bay Watershed Project
- Alabama Department of Conservation and Natural Resources
- Citizens Advisory Committee for the Weeks Bay Watershed Project
- Coastal Alabama Clean Water Partnership
- In-kind services from the landowner and other partners working on the project.

The objectives and priorities of the project were improved water quality, reduced soil loss and sediment, and improved wildlife habitat. Restoration activities included construction and installation of rock structures with geotextile fabric; grading and shaping of critical areas; recommendations for grass planting, seeding rates, and nutrients applied; installation of thick layers of mulch and terraces with pipe outlet; and recommendations for tree plantings and other vegetation to benefit wildlife.

There were several key players in getting the conservation practices installed. Working on the project from the Baldwin County SWCD and NRCS team were: Ann Biggs, District Administrative Coordinator; Larry Morris, District Conservationist; Joyce Nicholas, Soil Conservationist; Carolyn King, Soil Conservation Technician; and Frank Fuqua, Technician for the SWCD. Technical input came from

NRCS Soil Conservatioist Joyce Nicholas (l) walks through a final check of the project with one of the contractors.

Stabilizing and restoring the gully helped prevent, reduce, and eliminate non-point sources of pollution in the watershed and helped improve the natural resources of the Gulf of Mexico.

Randall East, NRCS Area Engineer; and Mac Nelson, NRCS State Resource Engineer. Other key personnel were Wildlife Biologist, Randy Roach, US Fish and Wildlife Service; and Mike Shelton, Biologist, Alabama Department of Conservation and Natural Resources.

The Gulf of Mexico Program provided the primary funding; however, US Fish and Wildlife Service provided a portion of the financial assistance. In-kind services are credited from other agencies and the landowner.

Stabilizing and restoring the gully to a condition that does not compromise water quality standards improved key Gulf of Mexico habitats that support living resources. The project was a step in the right direction to prevent, reduce, and eliminate non-point sources of pollution in the watershed and protects important coastal watershed habitats.

Mary Beth VanPelt, representative for the Gulf of Mexico Program, commended those involved with the project and complimented them for work done in such a timely manner. The term of the project period was July 1, 2003-October 31, 2006. The partnership team had the project completed by February 21, 2005. Working together in a timely manner enabled the group to meet and exceed projected completion dates. Baldwin County SWCD District Administrative Coordinator Ann Biggs, who is no stranger to working with various agencies, states that, “The personnel at the Environmental Protection Agency at (GMPO) at Stennis Space Center, Mississippi, are the greatest folks to work with!”

Monroe County Landowner Appreciates NRCS Assistance

By Julie A. Best, Public Affairs Specialist, USDA-NRCS, Auburn, AL

Bill McDaniel of Monroe County, Alabama, has returned to the family land and is enhancing the 165-acre farm of his youth. After graduating from Tuskegee University, McDaniel's career took him away from his rural setting. While he was away, he never lost sight of the experiences that farm life taught him. He feels, however, that minority youth in the area have lost sight of the farming lifestyle and the work ethic that was so beneficial to him.

McDaniel plans to turn a portion of the family property into a youth training center. His idea is to make a portion of the farm available to youth, or whole families, to manage the land as their own.

Two years ago, McDaniel implemented a truck-cropping system called plasticulture. The system was installed as a demonstration project with the Ala-Tom Resource Conservation and Development (RC&D) Council. "The last two years have been a learning curve," says McDaniel. "We now have the water system installed, and we know how to establish the plasticulture beds."

Plasticulture is a part of McDaniel's concept for reconnecting minority youth with the farming. He installed the water system and the beds on his farm, and has made plots available to youth or families who want to rent the space to grow vegetables. "It becomes theirs. It's a whole new beginning for farmers in this area," says McDaniel.

Farming with plasticulture requires a different mindset from traditional truck farming. "Truck farmers are used to planting some things, then do a lot of praying. With plasticulture, you manage the crop, which includes planting, fertilizing, and watering," says McDaniel. Because the black plastic warms the ground, crops can be planted earlier. Drip irrigation, a part of the system, must be managed to provide adequate moisture for the plants. Because of these managed conditions, crop yields are high. "I had about twelve boys involved in the project last year and they have indicated that they want to try again next year," says McDaniel. Last year they grew watermelons, okra, and pole beans. They marketed the produce through a roadside market and a farmer's market in Nashville, Tennessee, where McDaniel lives.

The target of this year's focus is to establish a grazing system with assistance from Environmental Quality Incentives Program (EQIP) funds. "Installing the grazing system is going to recapture a segment of the farm. Fifteen years ago, my dad had the pasture fenced and cattle running. We're going to improve upon that system by putting in water troughs and cross fencing."

McDaniel says, "What I'm doing isn't new. I'm just repeating history. I'm just capitalizing on what my Daddy did. He took advantage of the assistance provided by NRCS, and I am continuing that tradition. I can't walk in Dad's footsteps, but at least I hope I'm following in his toe prints."

(top) With assistance from RC&D funds, McDaniel installed plasticulture beds and a drip irrigation water system.

(l) McDaniel talks with Monroe County NRCS DC Amy Bell about installing a grazing management system in this pasture.

Soil Survey Digitization at Alabama A&M University

By Joe Gardinski, NRCS GIS Specialist, N AL Regional Soil Survey Office (NARSSO), Normal, AL

On August 29, 2003, NRCS and Alabama A&M University (AAMU) entered into a cooperative agreement to digitalize and compile the soil sata for Lauderdale, Colbert, and Marion Counties, Alabama, using remote sensing, photogrammetry, and GIS technologies. Dr. Wubishet Tadesse, Asst. Professor, GIS and Remote Sensing, is heading up the effort for AAMU. I am providing technical support and training to AAMU student workers.

Based on the available data, we determined that Lauderdale County would be the first project. Materials provided included digital contact prints, DOQQ's, and soil composite overlays. Dr. Tadesse and his students defined the process of converting the soil surveys to digital form and put it into a plan of action. A major contributor to the final process was the NCGC in Ft. Worth. Three students were assigned to different aspects of the project which started in August 2004.

The next phase of the process was to use the scanned images and convert them to orthophotos using OrthoMapper Software. The composite overlays were georeferenced to the orthos. Using ArcGIS 8.3, a personal geodatabase, feature dataset, and feature class was created for Lauderdale County in UTM NAD83 Zone 16 projection. A county legend was downloaded from NASIS. This legend table was converted to a domain for use in attributing the Lauderdale County feature class in the geodatabase. A topology layer was created and rules were assigned to check for errors. The rules applied were "no gaps" and "no overlaps." This topology is helpful in correcting any errors in line features to be created.

Digitizing work was ready to begin. In the editor mode in ArcMap, the auto complete polygon task proved to be quite a time saver in the digitizing process. Once features were created for stand alone polygons, the auto complete function was extremely helpful in tying into the existing polygons and reducing topology errors. The polygons were attributed using the domain created from the legend. This equates to the map unit symbols being in a "drop down" label field to select instead of typing them individually. Using this process, over 10,500 polygons were created in 400 hours by the students.

The next step was quality control. While the soil polygons were being created and attributed, the topology was validated for errors in the line features on each composite sheet. Other quality control checks included checking for missing labels in the table and looking for areas that were smaller than the minimum size units. The latter check would help to identify smaller features that have also been attributed. Common soil lines were checked using a process defined initially by the NCGC. This check was further streamlined by a common soil line model provided Caryl Radatz of the Missouri Digitizing Unit in ArcGIS 9.0. Fortunately, Dr. Tadesse had ArcGIS 9.0 for use in the project.

The final quality control check was performed by visually checking the digital lines and map unit symbols on each individual map sheet copy against the corresponding hard copy soil survey map sheet. Errors were corrected on the digital file. NRCS personnel performed quality assurance checks prior to submission to the Alabama NRCS State Office, MO-18, and the Digitizing Unit in Missouri.

On March 1, 2005, data generated from the Lauderdale County project was provided by AAMU to NRCS in shapefile, coverage, and geodatabase format. The students are now digitizing the Soil Survey of Colbert County. Marion County is also slated for completion by January 2006.

When asked what are some of the benefits derived from the first phase of this project, Doug Clendenon, NARSSO MLRA Project Leader said, "This project has provided a boost to NRCS activities in this region. Prior to digitizing, georeferenced soil maps have proved to be a great value in GIS to updating soil surveys and planning conservation efforts. Old soil survey maps can be difficult to read and verify in the field. Georeferencing raster maps allows the use of old soil mapping with new digital photography thereby aiding soil map use in GIS for farm planning, EQIP, CSP, etc., and for uploading potential soil sampling points into a GPS receiver."

Acronym Directory:

CSP - Conservation Security Program
DOQQ's - Digital Ortho Quarter Quads
EQIP - Environmental Quality Incentives Program
GIS - Geographic Information Systems
GPS - Global Positioning System
NAD83 - North American Datum of 1983
NARSSO - North Alabama Regional Soil Survey Office
NASIS - National Soil Information System
NCGC - National Cartography and Geospatial Center
UTM - Universal Transverse Mercator

AAMU Professor Dr. Tadesse instructs student worker Rick Fields on the Lauderdale County soil digitization project.